WHAT IS CLAIMED IS:

1. An integrated optical parametric oscillator for converting a pump radiation into a signal wave and an idler wave and fine tuning the signal wave, comprising:

an incident plane being anti-reflective to the pump radiation and reflective to the signal wave and the idler wave;

an optical parametric oscillation region in front of the incident plane along an optical path of the pump radiation, the optical parametric oscillation region being operative to convert the pump radiation into the signal wave and the idler wave;

a grating plane in front of the optical parametric oscillation region along optical paths of the signal wave and the idler wave, the grating plane being operative to diffract a portion of the signal and idler waves and reflect the other portion of the signal and idler waves;

an emerging plane, being anti-reflective to the signal wave and reflective to the pump radiation and the idler wave, the second coating being located along the optical path of the signal and idler waves diffracted by the grating plane;

a reflecting plane, being reflective to the pump radiation, the signal wave and the idler wave, the reflecting plane being located along the optical paths of the other portion of the signal and idler waves reflected from the grating plane; and

a fine-steering region between the reflecting plane and the grating plane, the fine-steering region being operative to change the optical path of the signal wave incident onto the grating plane.

2. The integrated optical parametric oscillator of Claim 1, wherein the incident plane, the optical parametric oscillation region, the grating plane, the emerging plane, the reflecting plane and the fine-steering region are integrated on a single slab of a nonlinear optical bulk material.

3. The integrated optical parametric oscillator of Claim 2, wherein the nonlinear optical bulk material includes a lithium niobate material.

4. The integrated optical parametric oscillator of Claim 2, wherein the optical parametric oscillation region includes a part of the nonlinear optical bulk material being periodically poled.

5. The integrated optical parametric oscillator of Claim 2, wherein the fine-steering region includes a part of the nonlinear optical bulk material and a pair of electrodes deposited on two opposing surfaces of thereof.

6. The integrated optical parametric oscillator of Claim 2, wherein the fine-steering region includes a part of the nonlinear optical bulk material subjected to an electric field.

7. The integrated optical parametric oscillator of Claim 1, wherein the pump radiation has a wavelength of about 1.064 micrometers, the signal wave has a wavelength of about 1.54 micrometers, and the idler wave has a wavelength of about 3.442 micrometers.

8. The integrate optical parametric oscillator of Claim 1, wherein the pump radiation has a wavelength of about 1.064 micrometers, the idler wave has a wavelength of about 1.54 micrometers, and the signal wave has a wavelength of about 3.442 micrometers.

9. The integrated optical parametric oscillator of Claim 1, wherein the grating plane includes a holographic grating with about 200 to about 500 grooves/mm.

10. An integrated optical parametric oscillator, comprising a nonlinear optical bulk material, which includes a locally periodically poled region and a steering region subjected to an electric field.

11. The integrated optical parametric oscillator of Claim 10, wherein the nonlinear optical bulk material includes a lithium niobate.

12. The integrated optical parametric oscillator of Claim 10, wherein the locally periodically poled region has a length of about 30 mm.

13. The integrated optical parametric oscillator of Claim 10, wherein the nonlinear optical bulk material further comprises a plurality of exterior coated planes forming a resonator of a wave at predetermined wavelength.

14. A tunable, narrow-line laser system, comprising:

a pump radiation source, operative to generate a pump radiation;

an integrated optical parametric oscillator, including a nonlinear optical bulk crystal, which further comprises:

an incident plane of the pump radiation;

an optical parametric oscillation region converting the pump radiation into a signal wave and an idler wave;

a grating plane, reflecting a portion of the signal and idler waves and diffract the other portion of the signal wave and the idler wave;

an emerging plane, emerging the other portion of the signal wave diffracted from the grating plane and reflect the other portion of the idler wave diffracted from the grating plane;

a reflecting plane, reflecting the portion of the signal and idler waves reflected from the grating plane; and

a steering region between the grating plane and the reflecting plane for generating optical path difference of the portion of the signal and idler waves reflected from reflecting plane and incident on the grating plane.

15. The tunable, narrow-line laser system of Claim 14, wherein the pump radiation source includes a Nd:YAG laser.

16. The tunable, narrow-line laser system of Claim 14, wherein the nonlinear optical bulk crystal includes a lithium niobate crystal.

17. The tunable, narrow-line laser system of Claim 14, wherein the optical parametric oscillation region includes a periodically poled region of the nonlinear optical bulk crystal.

18. The tunable, narrow-line laser system of Claim 14, wherein the optical oscillation region has a length of about 30 mm.

19. The tunable, narrow-line laser system of Claim 14, wherein the optical oscillation region being operative to convert the pump radiation into the signal wave with a wavelength of about 1.54 μm and the idler wave with a wavelength of about 3.442 μm.

20. The tunable, narrow-line laser system of Claim 14, wherein the optical oscillation region being operative to convert the pump radiation into the signal wave with a wavelength of about 3.442 μm and the idler wave with a wavelength of about 1.54 μm.

21. The tunable, narrow-line laser system of Claim 14, wherein the steering region includes a region of the nonlinear optical bulk crystal subjected to an electric field.

22. The tunable, narrow-line laser system of Claim 14, wherein the incident plane, the grating plane, emerging plane, and the reflecting plane are all reflective to the idler wave and arranged as a resonator of the idler wave.